CALAR II

COOPERATIVE ARID LANDS AGRICULTURAL RESEARCH PROJECT
(CONTRACT ANE-0158-G-00-0017-00)

MID-TERM EVALUATION
FEBRUARY 28 - MARCH 21, 1993

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EXECUTIVE SUMMARY

A ORIGINATING OFFICE AND TITLE

This evaluation was initiated by the contractor, San Diego State University Foundation, and approved by AID/W/ANE, and is a mid-term external evaluation of grant No A N E -0158-G-00-0017-00, CALAR II, Protected Agriculture The evaluation was conducted from February 28 to March 21, 1993 in Israel and Egypt

B PURPOSE OF THE ACTIVITY EVALUATED

The purpose of CALAR II is to conduct applied agricultural research through full cooperation between Egyptian and Israeli scientists This research focuses on protected agriculture in arid lands, and is expected to concentrate on crops and products significant to both countries The sector goal addressed by the project is cooperation between Egypt and Israel, with close interaction between scientists and technical personnel in the two countries

C PURPOSE AND METHODOLOGY OF THE EVALUATION

The evaluation was conducted as a mid-term review, as specified in the approved project plan The evaluation concentrated on direct inspection of all major project research sites in Israel and Egypt, and interviews with nearly all participating project staff The team attended the entire Third Scientific Workshop of CALAR II, at Alexandria, Egypt All pertinent project documentation, published reports, and workshop abstracts were examined The team had personal conferences with senior Ministry officials in both countries, including an extensive meeting with His Excellency Dr Youssef Waly, Minister of Agriculture and Land Reclamation/ Deputy Prime Minister of Egypt

The team had also discussions with officials and was accompanied on site visits in both countries by Dr Ed Rice of Winrock International, representing AID/W/ANE

D FINDINGS AND CONCLUSIONS

1 CALAR II has made excellent progress towards its major goal--that of strengthening research cooperation between Egypt and Israel

2 The research being conducted is significant to mutual problems in practical agriculture in both countries It is aimed at maximizing economic returns and water-use efficiency in arid land agriculture

3 Work planning and project administration are functioning smoothly and effectively

4 A rapid increase is occurring in the number and total area of protected structures, particularly in Egypt From approximately 2,000 such structures in that country in the late 1980's, the number has grown to more than 17,000 in current operation CALAR II research appears to have been important in stimulating this increase

5 Project results are being achieved at relatively low cost and with efficient utilization of research personnel and facilities

6 Through varietal selection and effective use of saline water in irrigation, "Desert Sweet" tomatoes and melons are being made available to the commercial market

7 Promising results are being derived from plant breeding activities, particularly in resistance to a serious virus disease of tomatoes, and powdery mildew in melons and cucumbers

8 Promising work is being done on low-cost (solar) heating of protected structures Expansion of research on protected structures is a high-priority need

E RECOMMENDATIONS FOR THIS ACTIVITY AND ITS OFFSPRING

The team recommends to AID and CALAR II administrators the following important actions

- Continue the general project structure and financial support at levels presently authorized and planned

- Increase research emphasis on crop breeding in Egypt, and exchange germplasm and integrated pest management techniques in both countries

- Begin planning for one or more follow-on regional projects The team felt that pre- and postharvest activities in protected agriculture would be a useful focus for such projects, but did not wish to make this choice exclusive of other appropriate areas

- Continue and broaden the present internal review/workshop system, and conduct at least one more external review before the project is completed

F LESSONS LEARNED

This project, and the preceding CALAR I, have demonstrated clearly that successful and meaningful scientific collaboration between Egypt and Israel can be conducted The keys to this success, in the opinion of the evaluation team, have been

- A genuine desire to cooperate on the part of senior ministry officials in both countries

- A reasonable level of funding and adequate support by AID/Washington

- Cooperation of USAID/EGYPT and American Embassy/Tel Aviv officials involved

- Sensitive and diligent coordinating operations by the Contractor (SDSU Foundation)

- Enthusiastic and effective participation among project coordinators from all three countries

- Participation of skilled research scientists in the project This includes a significant proportion of excellent younger research workers

- Allocation of the maximum possible proportion of project funds to activities in the host countries

I PROJECT DATA SHEET

1 **Countries** Egypt and Israel (joint regional project)

2 **Project Title:** Cooperative Arid Lands Agricultural Research Program II (CALAR II) In Protected Agriculture

3 **Project number** Grant No ANE-0158-G-00-0017-00

4 **Project Dates**

A First Grant Agreement May 30, 1990
B Planned final obligation FY 1994
C Most recent funding date April 2, 1992

5 **Project Funding**

A AID total estimated grant $6,298,442
B Amount obligated to date $4,523,000
C Other major donors None

6. **Mode of Implementation**

AID Grant to San Diego State University Foundation, with major sub-grants to the Ministry of Agriculture and Land Reclamation (Egypt) and Ben-Gurion University of the Negev (Israel)

7 **Project Designers**

Ministry of Agriculture and Land Reclamation (Egypt), Ben-Gurion University of the Negev (Israel) under sponsorship of the Joint Egypt-Israel Agricultural Committee, in cooperation with the San Diego State University Foundation

8 **Responsible U S Government Officials**

A U S Embassy, Tel Aviv- Dr D Maulinex, Science Attache
B USAID Mission, Cairo- Mr David Delgado, Office of Agriculture
C AID/Washington/Mr Henderson Patrick

9 **Previous Evaluation**· None

II. PURPOSE OF REVIEW AND STUDY QUESTIONS

The review was conducted to provide a mid-term evaluation of CALAR II The primary purpose was to assess the success of the project in developing and furthering cooperation between Egypt and Israel in protected agriculture research in arid lands, emphasizing problems which are common to both countries

Emphasis was placed on accomplishments and achievements to date, and on objectives to be accomplished during the remaining period of project funding Attention was also given to the question of whether any restructuring of project organization or priorities is needed

It is expected that results and recommendations of the evaluation will be used by the CALAR II Steering Committee, the Agency for International Development and the Governments of Egypt and Israel to plan further work in cooperative research on arid lands agriculture

Specific study questions considered included the following

1 Is the research being conducted under the project truly relevant to significant agricultural problems confronting Egypt and Israel?

2 What is the nature and extent of cooperation between Egypt and Israel which can be attributed to project activities?

3 Has the project achieved satisfactory progress toward the stated research objectives? (Specific evidence should be cited)

4 Have project activities been conducted in a cost effective manner?

5 How has the proposed system of Peer Review operated in actual practice, and what are its limitations, if any?

6 Have any positive or negative impacts of project activities become apparent?

7 In how far are project activities or effects likely to be sustainable after AID support terminates?

8 What lessons have been learned which might affect
   a Development of possible follow-on projects?
   b Other regional projects or programs?
   c Appropriate new bilateral projects?

9 Is any major restructuring of the existing project needed?

III EVALUATION TEAM COMPOSITION

The team for this external evaluation was selected by the San Diego State University Foundation, with the advice and concurrence of AID/ANE, Washington It consisted of three persons, each with significant technical experience in professional fields closely related to CALAR II project activities, and two with extensive administrative experience in international agricultural development Dr Earl Leng, the team leader, was selected initially by AID to lead the CALAR I mid-term external evaluation of 1984 He also served as project leader of the the end-of-project review of CALAR I in 1988, and the initial review of the Maryut Project in 1990

Team Leader/Research Cooperation Specialist

Dr Earl Leng, Agricultural Development Consultant
Retired Professor of Agronomy, University of Illinois and University of Nebraska

Over 40 years professional experience in international agricultural development, extensive participation in AID projects in many countries Chief, Crops Division, Office of Agriculture, AID/Washington 1975-77 Program Director, Sorghum/Millet CRSP, 1979-84 Project design teams, Sudan 1977, Jamaica 1985, leader, several major project evaluation teams

Research Administration Specialist/Agricultural Economist

Dr Frank J Moore, Economic Development Consultant
Retired Economist, Agency for International Development

Over 45 years professional and business experience in international development, with significant concentration on agricultural problems and projects Experience includes service with the Ford Foundation, Stanford University International Development Education Center, and the Agency for International Development Director, Office of Project Planning and Design, USAID/AGR/Cairo, Division Chief, Africa Bureau, AID/Washington Chief of Party, Cameroon Agricultural Policy Planning Project, 1989-91

Protected Agriculture/Horticulture Specialist

Dr Mary Peet
Associate Professor, Horticultural Science, North Carolina State University

Nearly 20 years teaching and research experience in technical and scientific aspects of vegetable crop culture, with strong emphasis on crop growth under protected environmental conditions Extensive publications in technical and applied aspects of vegetable crop production Professional travel to India, Taiwan, and Europe

IV. PROJECT BACKGROUND

This project, CALAR II - Protected Agriculture, utilized the successful experience in tripartite cooperation (Egypt - Israel - United States) of the first CALAR project to focus on the development of protected agriculture, which is a high priority for the Governments of both Egypt and Israel

The first CALAR Project was initiated in March, 1982 as a regional program of the Near East Bureau of the Agency for International Development (now AID/W/ANE) It had its roots in agreements between the President of Egypt and the Prime Minister of Israel in 1980, expressing common interests in the development of agriculture in arid lands

Originally proposed at a funding level of $10 million for 5 years, CALAR was approved at a level of $5 million for the same period, and eventually continued over a total period of 8 years It concentrated on three major research and development topics in both Egypt and Israel These were

- The use of saline water to produce crops in arid environments,
- Improving the production of small ruminant animals (sheep and goats) in desert environments, and
- Trials of plant species not native to the two countries, which might have promise as commercial or forage crops, or for production of industrial raw materials

An "end-of-project" review, conducted late in 1988, indicated that the project had been successful in achieving working-level scientific cooperation between the two countries, as well as a highly successful degree of policy and administrative coordination among Egyptian, Israeli and United States agencies involved Excellent progress toward many of the specific research objectives was apparent At the same time, the review team recommended certain adjustments of research emphasis and financial support within the existing project, and particularly that "one or more appropriate follow-on projects should be developed "

In response to the latter recommendation, persons from Egypt, Israel and the United States with experience in CALAR and related activities began meeting in 1988 to develop a regional program in protected agriculture This topic was chosen by the Governments of both Egypt and Israel as being of high priority, for similar reasons

In both countries, the prevailing arid conditions mean that water for agriculture and for human consumption is the major limiting factor in agricultural production Protected agriculture gives the highest cash return for units of water used, and is a highly effective means of water conservation

After meetings in the United States and Cairo in 1988, and in London, Egypt and Israel in 1989, an agreed proposal for "CALAR II - Protected Agriculture" was submitted to the Agency for International Development and was approved for grant funding in March, 1990 The approved grant term was 5 years, with a start date of April 10, 1990, at a planned total funding level of $6,298,442 and with an initial obligation of $1,250,000 for the period ending in mid-April, 1991 Subsequent funding obligations, to the total amount of $4,523,000, have continued Project authorization up to September 30, 1993 The planned date of Project completion is March 26, 1995 Research and development activities of the Project are conducted entirely in Egypt and Israel Only consultant and administrative functions are conducted in the United States Project headquarters are at the San Diego State University Foundation (SDSU), which is also the fiscal agent and the base office of the Project Coordinator This individual is responsible for on-going coordination within the Project and for country-to-country linkages Technical supervision of project activities is carried out by a tripartite Steering Committee, made up of two representatives from each of the three countries

Under the Project, research activities on vegetables and closely related technologies utilize between 50-60% of total program resources Some 20% are devoted to non-specific but related technology, and the remainder are utilized for research on ornamentals, fruits and mushrooms Major disciplinary fields encompassed in the Project are

* Agromanagement
* Environmental modification
* Genetic modification
* Structure design and selection
* Market analysis and postharvest research

Of these five topics, the first three listed are currently receiving major emphasis The two latter topics have thus far been given minor attention

The present evaluation is the first major external review of CALAR II Three Scientific Workshops have been held, the most recent in Alexandria, Egypt, March 8-11, 1993, coincident with the present External Review and attended by the full evaluation team

V FINDINGS OF EVALUATION TEAM

A OVERALL PROJECT STRUCTURE AND OPERATIONS

The team has the following observations regarding project structure and the operations of CALAR II to date

1 Project activities are closely related and highly relevant to significant agricultural problems in both Egypt and Israel In particular, protected agriculture offers an opportunity for maximizing water use efficiency and cash returns to producers, particularly on smaller acreages of cultivation The end-use of products differs in the two countries, with Israel emphasizing the high-quality, off-season export market, and Egypt being more concerned with quantity of production for the domestic market

2 Project activities, and those under CALAR I, have set an important pattern for close collaboration between Egypt and Israel on agricultural problems of mutual concern Specific examples of such collaboration include

- Three joint workshops covering the full range of CALAR II research topics have been held since project inception The first workshop was held in San Diego in April, 1991, the second in Beer-Sheva, Israel, in March, 1992, and the most recent in Alexandria, Egypt, in March 1993 All have been attended by a large number of Egyptian, Israeli, and U S participants in CALAR II research Approximately 26 Egyptian, 18 Israeli, and 7 U S scientists attended the most recent workshop, as did all members of the outside evaluation team

- Planning and administration of the project has been closely coordinated between the two countries and with the U S based project administration Personal relationships between participants and administrators from all three countries have been excellent

- Exchange of germplasm and breeding materials is occurring in several crop species of importance to both countries

- "Desert Sweet" tomatoes and melons have been brought to the market in Israel

3 In general, it appears that very satisfactory progress is being made toward research objectives of the project However, little active research has been done on market analysis or postharvest utilization Examples of especially good progress toward project research goals include

- Incorporation of resistance to powdery mildew in cucumbers
- Incorporation of resistance to yellow leaf-curl virus in tomatoes
- Progress is being made toward the development of tomatoes resistant to a serious insect pest, the tobacco whitefly (Bemisia tabaci Genn)
- Good progress has been made in greenhouse climate modeling and in the design of low-cost solar greenhouses suitable for desert conditions
- Commercial "Desert Sweet" tomatoes and melons (mentioned above) are being produced by proper use of saline water for irrigation
- Potentially important new crops including oyster mushrooms, Hylocereus (a columnar cactus or pitaya), Kiwano, and Heliconia flowers, are being readied for commercial production
- Further progress has been made on the practical utilization of saline water in crop production (studies begun as part of CALAR I)

4 The evaluation team considers that project activities have been conducted in an effective manner, and at very reasonable cost In several instances, facilities and equipment developed or installed under CALAR I have been made available for use in CALAR II research, thus making efficient use of project funds

5 The system of Peer Review proposed in the project grant document was established in Egypt, but has not been put into operation in Israel, in that scientists outside the project structure have generally not been brought into the internal review system A more detailed analysis of the reasons for this and the effects on project procedures is presented in the technical report of Dr Leng (Appendix 6) The evaluation team considers that the internal review currently being utilized in CALAR II functions well, however It does not impair the scientific validity or the relevance of the research being conducted These conclusions are supported by demonstrated applicability of the research findings to field conditions

6 Positive impacts of the project are readily apparent and of significant scale These include

- Greatly improved cooperation between Egyptian and Israeli agricultural scientists working in the field of protected agriculture
- Increases in the number of protected agricultural structures in Egypt from 2,000 in the late 1980's to over 17,000 at present
- Noticeable increase in the participation of junior research scientists in both countries
- Administrative coordination between United States, Egyptian and Israeli agencies has been smooth and effective Planning and day-to-day operations have been conducted with little friction and with high efficiency in a sensitive political milieu which could have otherwise caused great difficulties

7 No significant negative impacts are apparent

8 The team expects that major aspects of the present research program would be continued, on a sustained basis, within Israel and Egypt, in the event that AID and other donors discontinued "outside" support of CALAR II and related activities However, if the present political climate in the Middle East does not improve significantly, the team considers that close scientific cooperation and coordination between the two countries, now existing under CALAR II, probably would not continue

In the event that a formal general Middle East peace accord is reached, the team considers that CALAR I and II have laid a foundation upon which cooperation between Israel and Egypt can and very likely would be sustained Moreover, the successful experience in cooperation under CALAR might well serve as a model and foundation for wider regional cooperation

9 The team strongly believes that AID support for this or closely related activities should be continued at reasonable levels until such time as the "peace process" can yield a "peace dividend" to provide a firm basis for collaboration of the type now taking place

10 Lessons which have been learned from CALAR II will be specified in detail in part VII, "Conclusions "

11. There appears to be no reason for any major restructuring of CALAR II, except perhaps for undertaking more work on market analysis and postharvest handling The evaluation team, considering available project resources and the limited project authorization time remaining, considers that the latter topics might best be handled under a separate, follow-on project of longer duration

B AGROMANAGEMENT

Egyptian research efforts in the area of agromanagement, as represented by Workshop reports, were concentrated in the areas of predicting and optimizing water use in greenhouses and in overcoming the effects of cold and salinity stress using chemical protectants

Most of the Workshop papers (7) represented research on cucumbers, but there were also reports on tomatoes, peppers and melon In addition to research reported in the Workshop, Dr Abou Hadid, the Egyptian PI, described work either in progress or planned in the following agromanagment areas potting media, recirculating sand and hydroponic culture, use of manure composts and I P M practices to produce vegetables that could be marketed as 'organic', alternative, locally available fertilizers for nutrient film technique (N F T type) hydroponic systems, low tunnel and aeroponic structures for growing vegetable crops and strawberries, introduction of new crops and feasibility of new heating system and greenhouse designs

In the Israeli presentations, there was less focus on agromanagement as a whole, with only 3 of the 13 abstracts being in this area The 3 Israeli papers on agromangement are not aimed at improving yields Rather, they focused on the necessity of producing attractive and flavorful produce for the highly competitive export trade to Europe Experimental treatments aimed at improving quality included manipulations of fertilizer, salt concentration, plant architecture, plant density, root/shoot relations and genetic manipulations

Although not necessarily represented by specific papers, there was also mutual interest in the following agromanagement areas Reducing the stressful effects on plants of the low and high temperature extremes found in desert climates, manipulating salinity to change growth rates or fruit quality, and plant protection from diseases and insects

C ENVIRONMENTAL MODIFICATION AND STRUCTURES

These two topics are highly related because of the way protected agriculture is practiced in Israel and in Egypt In most cases, greenhouses are heated only by solar radiation during the day and by trapped heat re-radiated at night Ventilation is also passive, in many cases Thus, there would be little point in investigating optimal temperature ranges for particular vegetables In any case, these temperature ranges are well-described from studies in temperate-zone greenhouses Rather, CALAR participants have focused on strategies for protecting plants from temperature extremes by the use of interior plastic mulches and tunnels and possible chemical protectants against chilling (Egyptian research), or breeding for chilling tolerance and design of more efficient solar greenhouses (Israeli research)

In summary, there was mutual research interest in optimizing greenhouse design to reduce plant stress and improving stress tolerance in greenhouse crops

D GENETIC MODIFICATION

Research presentations in this area generally reflect the previously-discussed themes of plant protection, quality improvement and stress tolerance Breeding for powdery mildew resistance in cucumbers in Egypt and breeding for tomato yellow leaf curl virus tolerance in tomatoes in Israel are both promising efforts These breeding programs, to the extent they are successful and germplasm is made available, represent valuable contributions to agriculture, not only in Egypt and Israel, but elsewhere in the Middle East Genetic modification is a high priority in Israel, representing the largest single area of research concentration (4 out of 13 papers in the Workshop) Besides the virus-tolerant tomato breeding program, breeding efforts focused on improving soluble solids in melons for export and reducing the effects of cold stress on melons

E MARKET ANALYSIS AND POSTHARVEST RESEARCH

There were relatively few papers in this area presented at the Workshop A packaging study was conducted on tomatoes in Egypt and a study was conducted in Israel on using ethylene to induce uniform color change in kiwano, a new crop being developed in Israel for the export market The area of postharvest physio- logy was considered to be very important in Egypt, as discussed by Dr Abou-Hadid in his introductory remarks He felt, howe v e r ,

that current resources were not adequate to undertake a significant research effort in this area Other work going on in Egypt to improve fruit quality included lentils, green beans and cucumbers and studies on growing pesticide-free cucumbers Techniques for growing low-nitrate lettuce in N F T type hydroponic systems are being developed This fruit quality research is aimed at taking advantage of higher prices received in export and selected local market for more attractive produce and produce that is perceived as more healthful Israeli interest seemed to focus, as previously discussed, on ways to improve the quality of greenhouse produce so that its appearance and flavor when it reached the consumer would be improved This is also rightfully considered a postharvest concern since even the most technologically advanced postharvest handling will not improve the appeal to the consumer of produce that is unattractive or tasteless when it first comes out of the greenhouse

F FLORICULTURE AND NEW CROPS

Presentations in this area dealt with oyster mushroom cultivation in Egypt and production of Hylocereus (pitaya) and Heliconia (a relative of the bird of paradise flower) in Israel Research on other floricultural crops such as Lisianthus and Asclepias which are relatively new to commercial production, was also discussed The Egyptian research on methods and economics of oyster mushroom production seems particularly promising and was also of interest to Israeli participants It is likely that any discussion of research on new crops is mutually beneficial, since the cultural practices are not established from work elsewhere

VI. CONCLUSIONS DRAWN FROM FINDINGS

A The review team considers that CALAR II has made excellent progress toward the majority of its research objectives and has evidenced superior performance toward the achievement of cooperation between Israel and Egypt

B The focusing of research activities onto problems of protected agriculture has resulted in an effective concentration of research personnel and facilities on an aspect of agriculture very important to both countries

C. No major structural or administrative problems have arisen

D Exchange of germplasm between Egypt and Israel is occurring in a satisfactory manner

E Three excellent scientific workshops have been held in the first three years of the project

F The review team believes that the project activities would benefit if more specific work plans were made for each sub-project and circulated for comment, perhaps at the annual workshops

G The review team was particularly impressed with the work done on biological control of greenhouse insect pests

H There appears to be need for more research emphasis on structures for protected agriculture, particularly considering low cost and the need for controlling temperatures at both the high and low ranges

I Funding and administrative support have been available in a manner which has led to smooth and uninterrupted project performance

J The project provides a useful model for the development of additional regional programs, and would serve as a sound basis for any intended follow-on projects

VII RECOMMENDATIONS

The review team recommends to CALAR II project administrators and to AID the following actions

A. Continue the present general structure and support levels of the project through the planned period of authorization

B Research results and project experiences should be published in some type of permanent record

C. Freer exchange of plant germplasm between Israel and Egypt should be encouraged

D If possible, emphasis on crop breeding should be increased in Egypt, particularly with melons, cucumbers and peppers

E Even more emphasis should be placed on integrated pest management under protected cultivation

F Project administrators should consider an expansion of the roster of U S collaborators

G Planning should begin on one or more follow on regional projects The review team does not consider it appropriate to specify topics for such projects, but believes that more attention to market analysis as well as pre- and postharvest production activities would be appropriate Consideration also should be given to expansion of cooperation to include other countries in the region

H At least one more external review should take place before the project is concluded

I Annual internal reviews should be broadened to include appraisal of major project plans for the coming years' work

SCOPE OF WORK

ARTICLE I - TITLE

Cooperative Arid Lands Agriculture Research Program II
(CALAR II) (Contract No ANE 0158-G-00-0017-00)

ARTICLE II - OBJECTIVES

The objective of this Work Order is to perform a midterm external evaluation of the above project This external evaluation is to be conducted to assess the success of the project in developing cooperation between Egypt and Israel and the potential for sustaining and increasing the cooperation in arid lands research on protected agricultural problems which are common to both countries The emphasis of the evaluation is on accomplishments and achievements to date and what needs to be accomplished in the remaining tenure of the project The evaluation results and recommendations will be used by the Agency for International Development and the Governments of Egypt and Israel as well as the CALAR II Steering Committee to assess the accomplishments of the project and to plan further work in cooperative agriculture research

ARTICLE III - STATEMENT OF WORK

The evaluation team shall consist of three members to evaluate the cooperative, administrative and technical aspects of the project The Team Leader will evaluate the cooperative aspects of the project, as well as the peer review system established by Egyptian and Israeli scientists as indicated in the project contract The team leader will also be responsible for assembling and finalizing the Evaluation Report The remaining team members will evaluate the administrative and the technical activities of the project as indicated below Objectives and specific tasks for the individual members are as follows

A Research Cooperation Specialist/Team Leader

Objectives. This part of the evaluation will measure the success of the project in developing cooperation between Egypt and Israel and indicate its potential sustainability According to the contract, "the main goal of the CALAR II Program is to expand the awareness in both Egypt and Israel that peaceful cooperation will result in social and economic benefits which far outweigh the prolonged tendency of mistrust " The major project purposes are to enhance scientific and technical cooperation between Egyptian and Israeli agricultural scientists, to insure that the research activities are conducted in a true cooperative

manner, and to optimize contacts and cooperation between Egyptians and Israelis participating in the project

Indicators. The evaluation will analyze and measure the extent to which the project has contributed to the development of contacts and linkages between Egyptian and Israeli scientists and institutions The evaluation will examine the type and nature of the contacts, relationships and cooperation which have resulted from the project

Specific tasks. These will include the following

- Indicate what system of Peer Reviews was established relative to the research program in Egypt and in Israel
- Indicate the effectiveness of the peer reviews in improving sub-project research procedures and goals
- Identify the Peer Review members involved and indicate their organizations and qualifications
- Evaluate the extent to which overall project objectives have been met
- Review and evaluate the peer review system adopted by the Egyptian and Israeli scientists
- Review implementation plans and recommendations with reference to actual project performance
- Evaluate how well the project has been managed, including improvements which may be appropriate
- Review and evaluate the Israeli and Egyptian Government support and the measures they have taken or need to take to ensure the stability and continuation of the project
- Evaluate the role of AID and the Contractor in supporting the cooperative aspects of the project, as well as the usefulness of the scientific and technical involvement of U S scientists
- Review and evaluate the factors, conditions, practices, and activities which encourage or inhibit cooperation

- Describe and evaluate the effects of external events, such as regional political developments, on the success of the project
- Evaluate lessons learned and formulate recommendations that may be used to appraise other regional projects and to design new regional projects

B Research Administration Specialist/Agricultural Economist

Objective. This part of the evaluation will focus on the administrative aspects of the project, including organization, planning, management, monitoring, staffing, reporting and funding, and will also reflect on the economic potential of the project

Indicators. The evaluation will analyze and measure the effectiveness of the project's organizational structure, timeliness of staffing, qualifications of personnel employed in the project, timeliness and quality of reporting, and timing and adequacy of funds flow Additionally, the economic potential of the project will be indicated

Specific Tasks. These will include the following

- Evaluate organizational structure of project within Egypt, Israel and the United States
- Evaluate contact arrangements between the three countries involved
- Evaluate technical qualifications of personnel assigned to project
- Compare actual staffing performance to approved project staffing plans
- Evaluate project reporting procedures to provide meaningful monitoring of the project
- Compare actual funding flow to funding plans, and comment on effects of project performance
- Evaluate the overall effectiveness of the administrative and personnel aspects of the project
- Reflect on the potential economic benefits to the Egyptian and Israeli population as well as the potential contributions of the project to the Egyptian and Israeli economy

- Reflect on the project's potential contribution to development of protected agriculture as a means of providing food for domestic consumption in Egypt and Israel
- Reflect on the project's potential contribution to the development of protected agriculture as a means to produce export products in Egypt and Israel
- Reflect on the potential contribution of the project to improve the socioeconomic status of farmers and growers in Egypt and Israel
- Reflect on the ecological impact of the introduction and dissemination of new or improved varieties and technologies
- Evaluate the overall impact of the project on the ecosystems in Egypt and Israel

C Protected Agriculture/Horticulture Specialist

Objectives. This specialist is to work jointly with the Research Cooperation Specialist /Team Leader and the Research Administration Specialist/ Agriculture Economist toward the objectives of the evaluation and on the specific tasks as listed below This specialist will analyze and evaluate the technical aspects of the sub-project activities specifically related to the five different technical domains of the project listed below

Indicators. The evaluation will analyze and measure scientific and technical levels of the research and the degree to which the research and scientific activities meet rigorous scientific standards Additionally, the evaluation will assess the scientific merits and contributions of the research

Specific Tasks. These will include the following

1 Agromanagement

- Evaluate research on the use of artificial growth media in protected environments
- Evaluate plant physiology research related to optimization of agromanagement procedures
- Evaluate the processes for development of new protected agriculture species and cultivars

- Evaluate the methods of intensive cultivation for specific crops in protected agriculture conditions
- Evaluate research on the control of pests and disease in protected agriculture crop production
- Evaluate computer-aided techniques in gathering and assessing the data required by CALAR II researchers

2 Environmental Modification

- Evaluate the overall CALAR II research program on environmental modification in Egypt and in Israel
- Evaluate the ways and the combination of ways in which heating, cooling, ventilation, carbon-dioxide enrichment and shading affect crop production in protected environments in the program
- Evaluate the use of unconventional heat sources for protected environments

3 Structure Selection

- Evaluate the research on the modification of structures for protected agricultural crops carried out by CALAR II scientists in Egypt and in Israel

4 Genetic Modification

- Evaluate the overall genetic modification research to optimize crop suitability for protected production within the framework of the project
- Evaluate the development of cold and heat tolerant cultivars
- Evaluate the improvement of the quality of selected vegetable, fruit and ornamental species within the framework of the project
- Evaluate research on means for determination of protected agriculture product quality
- Evaluate research on the extension of the shelf-life of the selected protected agriculture species

- Evaluate the introduction of genetically-controlled tolerance to disease and pests

5 Postharvest Research

- Evaluate research geared to improving product handling and extension of shelf life
- Evaluate postharvest research related to the improvement of product marketability
- Evaluate research geared to optimal harvest dates, and environmental control for storage and shipping

ARTICLE IV - EVALUATION METHODOLOGY

The evaluation team will examine the documentary evidence and interview project participants in Egypt, Israel and the U S The team will also visit research sites in Egypt and Israel and discuss the project with the principal investigators and the scientists Special caution and sensitivity will be exercised by team members because of potential political implications of the project in the Middle East

In Egypt and Israel

- Discuss project evaluation procedure and evaluation results with U S Embassy and USAID officials in briefings before and/or after the evaluation
- Examine project documents and reports
- Discuss project with Egyptian and Israeli project coordinators
- Discuss project administration practices in Egypt and Israel
- Discuss the specific results of scientific visitations with returning scientists
- Discuss and assess in-country contributions
- Visit appropriate project research sites in Egypt and Israel
- Discuss and examine measures needed to continue program after end of funding
- Discuss project with other appropriate governmental officials and members of the scientific community in Egypt and Israel

In the U.S.

- Discuss project with project coordinator and others at San Diego State University Foundation
- Discuss project with appropriate officials of AID
- Examine available project reports and other documents
- (Team Leader) finalize report, in consultation with SDSUF and AID

In order to provide the services required as stated above, team personnel shall be required to travel to and within Egypt and Israel, and the Team leader may visit AID in Washington, D C and San Diego State University Foundation, if necessary

ARTICLE V - REPORTS

Upon completion of the evaluation described herein, the Evaluation Team shall prepare and submit a complete unbound report to SDSUF within a four week period SDSUF shall be responsible for typing and reproduction of the report, and for submission of ten (10) bound copies as well as an electronic diskette, compatible with Word Perfect, to the Project Officer, at USAID/Washington, and one bound copy to each of the following USAID Cairo, U S Embassy-Cairo, U S Embassy-Tel Aviv, the Egyptian Coordinator and the Israeli Coordinator

The report shall conform to AID's Evaluation Handbook format, and shall contain the following

1) Project Identification Data Sheet, as outlined in Appendix A (attached)
2) Executive Summary, as explained in Appendix B (attached)
3) Table of Contents
4) Body of the Report, as discussed in Appendix C (attached)
5) Appendices, as discussed in Appendix C (attached)

The report shall describe the methodology, conduct and results of the evaluation It shall also reflect on the use of funds on both the technical and cooperative aspects within the framework of the project

ARTICLE VI - RELATIONSHIPS AND RESPONSIBILITIES

SDSUF shall be responsible for transportation and travel arrangements The Team Leader will be responsible to the CALAR project coordinator at SDSUF for conduct of the evaluation and submission of the report The team is expected to work closely and cooperatively with project personnel and appropriate officials of the Ministry of Agriculture of the Arab Republic of Egypt and the Ben-Gurion University of the Negev in Israel as well as other pertinent organizations in both countries

ARTICLE VII-TERM OF PERFORMANCE

Team members will be provided copies of the Project Agreement, technical proposals, and reports by SDSUF The effective date of this Work Order is February 28, 1993, and the estimated completion date is April 11, 1993

Subject to written approval of the Project Coordinator, the estimated completion date of this Work Order may be extended, providing that such extension does not cause the time for completion of the work and submission of the final report to extend beyond 30 calendar days from the original approved completion date Under no circumstance shall such extension authorize any expenditure in excess of the total amount approved for the performance of the work

PROGRAM DESIGN SUMMARY-LOGICAL FRAMEWORK
PROGRAM TITLE COOPERATIVE ARID LANDS AGRICULTURE RESEARCH CALAR II (CALAR II)

	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTION
Program or Sector Goal, The expanded objective to which this program contributes Cooperation between Egypt and Israel in coordinated scientific research with interaction between scientists and technical professionals	Measures of Goal Achievement Interaction both within as well as outside program auspices and continuity of these interactions upon program completion (Phase two)	1 Observation by program staff 2 Records of events, such as papers, reports, publications, demonstration plots, application, training, production, export 3 Evaluation missions	Assumptions for achieving goal targets That cooperation in scientific research and the achievements as a result between people can remove barriers to professional and social interaction Application of R&D results to address common concerns
Program Purpose Conduct cooperative applied research between Egyptian and Israeli scientists to introduce and improve production of protected agricultural crops and the use of arid lands for such production Demonstrate research methods and apply research results Provide non-urban and expanded employment opportunities for skilled, technical and non technical workers Develop a new range of competitive export products	Conditions that will indicate that purpose has been achieved, End of Program status 1 Joint participation in professional exchanges 2 Crops that can be successfully cultivated at the farm level 3 Techniques that can be successfully replicated and utilized at the farm level 4 Identification of crops with high market value in export markets 5 Development of intensive protected agriculture 6 Upgrading of professional workers, farmers, growers, and scientists 7 Successful application of program methods and techniques on a large scale basis	1 Cooperative participation 2 Selected plant growth and vigor indicators 3 Selected plant quality 4 Success of techniques and methods developed and/or studied 5 Results of products, crops, techniques and methods 6 Acceptability of program products, crops, techniques and, methods at farm level 7 Acceptability of program products in export markets 8 Improved economic conditions in regions involved in program	Assumptions for achieving program purpose 1 Professionals involved in program are able to cooperate in research and management 2 Crops can be introduced and improved that can be successfully grown under protected conditions in arid regions 3 Acceptance by farmers and growers of new crops, products, techniques and methods 4 Acceptance of program products in export markets

PROGRAM DESIGN SUMMARY-LOGICAL FRAMEWORK
PROGRAM TITLE COOPERATIVE ARID LANDS AGRICULTURE RESEARCH CALAR II

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTION
Outputs. 1 Continuity of professional co-operation and joint research projects fostered in original CALAR program 2 Data from development of crops and products as well as techniques and methods 3 Information on production of selected crops 4 Production of plant materials for replication 5 Trained production/research staff 6 Technology for production of out of season crops utilizing protected crops in desert regions 7 Trained production/research staff 8 Methodology and technology for production of protected crops in desert regions 9 Mechanisms for transfer of R&D techniques to farmers and growers in arid zones 10 Cement and further peaceful co existence	Magnitude of Outputs 1 Annual Workshop 2 Meetings between U S , Egyptian and Israeli members of Steering Committee 3 Meetings between Egyptian and Israeli Program Coordinators 4 Scientific meetings and exchanges between program participants 5 Short term training for participants, farmers and growers 6 Required reports during program 7 Construction of two R&D centers 8 Application of R&D results to arid regions in Egypt and Israel 9 Development and improvement of fruits, vegetables and ornamental crops grown under protection in arid desert regions 10 Establishment of two model demonstration centers	Program reports and outcome of extended evaluations will indicate and verify results	Assumption of achieving outputs 1 Resources and attitudes are such that cooperation will continue and proceed 2 Research results will provide useful data 3 Sufficient work has been done and technology exists to provide tangible results 4 Time is sufficient to realize successful achievement of Program Goals and Objectives

PROGRAM DESIGN SUMMARY-LOGICAL FRAMEWORK
PROGRAM TITLE COOPERATIVE ARID LANDS AGRICULTURE RESEARCH CALAR II

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTION
Inputs 1 Professional, technical resource specialists 2 Program administration 3 Equipment, supplies, research facilities 4 State of the art technical information 5 Demonstration plots 6 Participation of selected farmers and growers 7 Support personnel from participating organizations and institutions 8 Support from appropriate organizations and institutions in participant countries	Implementation Target (Type and Quantity) 1 Tomatoes, melons, eggplant, sweet pepper, cucumber, mushrooms, woody pot plants, tropical flowers, exotic vegetables, fruits and other selected ornamental crops 2 Selected variety of proven crops and cultivars for introductory work 3 Glasshouses and various plastic structures 4 Various irrigation, heating and cooling methods	Records of participating institutions, external evaluators, published reports and on-site visits and demonstrations	Assumptions for providing input. 1 Technology, skills, commitments and financial resources available are sufficient for this program 2 Time-frame is sufficient for this program (Phase One)

EVALUATION PROCEDURE AND METHODOLOGY

A. Reason for Evaluation

This evaluation was conducted in accordance with the plan for project review and evaluation submitted as part of the approved work plan This stated that "the external evaluation will be conducted early in the third year of the five - year program "

As stated in the approved Scope of Work, the evaluation was conducted "to assess the success of the project in developing cooperation between Egypt and Israel, and the potential for sustaining and increasing the cooperation in arid lands research on protected agricultural problems which are common to both countries "

B Timing of Evaluation and Relation to Plan

Planned for "early in the third year of the project," the undertaking of this evaluation in March 1993 was a few months late if project approval were to be taken as the starting date However, actual project activities operate on an annual schedule which begins in August to November, as imposed by the winter season in which protected agricultural research is most active Thus, the evaluation took place in the first half of the third research season

Also, the external evaluation was timed to coincide with the Third Annual Scientific Workshop of CALAR II, which is the major event of the planned annual internal project review

C Methodology

This evaluation included direct inspection of all major project research sites in Egypt and Israel, and all pertinent project documentation and published reports All team members attended the entire Third Scientific Workshop (internal review) at Alexandria, Egypt Nearly all participating Egyptian and Israeli research workers were interviewed, as were most of the United States - based scientific collaborators The team had personal conferences with senior Ministry of Agriculture officials in both countries, including an extended session with Dr Youssef Waly, Egyptian Minister of Agriculture and Land Reclamation/Deputy Prime Minister, and Dr Samuel Pohoryles, Director,

Rural Planning and Development Authority, Israeli Ministry of Agriculture The team also met with officials of the U S Embassy/Tel Aviv, USAID/Cairo, and was accompanied both in Israel and Egypt by Dr Ed Rice of Winrock International, representing AID/ Washington

D Detailed Documentation

Included in this report or its Appendices are

1 Evaluation team composition (part IV)
2 Scope of work (Appendix 1)
3 Project logical framework (Appendix 2)
4 Itinerary of review team (Appendix 4)
5 List of key individuals and agencies (Appendix 5)
6 Technical reports of team members (Appendix 6, 7 & 8)
7 Bibliography of key documents (Appendix 9)

ITINERARY OF REVIEW TEAM

Sunday, February 28, 1993

Team arrived in Tel Aviv, Israel Dinner meeting with Dr Samuel Pohoryles, and senior Israeli project personnel

Monday, March 1

Inspection of CALAR II site and research work at Volcani Center, Bet Dagan, travel to Beer Sheva Dinner meeting with officials of Ben-Gurion University of the Negev

Tuesday, March 2

Inspection of CALAR II sites at Ha Besor R&D Unit (Western Negev) and Ramat Negev Experimental Station Inspection of CALAR II research at Boyko Institute, Ben-Gurion University

Wednesday, March 3

Visit to Research Contracts Division, Ben Gurion University Completed inspection of research sites at Boyko Institute Return to Tel Aviv, late afternoon

Friday, March 5

Travel, Tel Aviv to Cairo

Saturday , March 6

Inspection of CALAR II research work at Dokki site, Egyptian Agricultural Research Center, Dokki/Cairo

Sunday, March 7

Conference with Dr Adel El-Beltagy, Director Egyptian Agricultural Research Center, Dokki/Cairo Travel via Desert Road to Alexandria

Monday, March 8

Inspection of CALAR II research site at El Bousseilly Attendance at opening session of CALAR II Third Annual Scientific Workshop/Internal Review

Tuesday, March 9 & Wednesday, March 10
Continuation of CALAR II Workshop

Thursday, March 11
Return to Cairo Meeting with Dr Youssef Waly, Egyptian Minister of Agriculture and Land Reclamation (also Deputy Prime Minister)

Friday, March 12 through Sunday, March 14
Team Conference and drafting of evaluation report

Monday, March 15
Visit to CALAR site at Ain Shams University, Cairo Meeting at Ministry of Agriculture, Cairo (Dr Leng only)

Tuesday, March 16
Drafting of evaluation report

Wednesday, March 17
Conference of evaluation team on report content Visit to USAID/Cairo

Thursday, March 18
Revise report draft

Friday, March 19
Assemble team report

Saturday, March 20
Conferences on report

Sunday, March 21-Monday March 22
Team return to U S

LIST OF INDIVIDUALS AND AGENCIES CONTACTED

SDSU Foundation

Dr Mohamed El-Assal	CALAR II Program Coordinator
Mr Tim Hushen	Director, Program Management

Winrock International/A.I D Washington

Dr Ed Rice	Consultant
Dr Herbert Blank	Agricultural Officer, AID Washington, NE/DR/PI

US. Embassy, Tel Aviv

Dr D Maulinex	Scientific Attache

U.S.A.I.D./Cairo, Egypt

Mr David Delgado	Director, Office of Agriculture

Ministry of Agriculture, Israel

Dr Samuel Pohoryles	Director, Rural Planning and Development Authority/ Steering Committee Member

Ben-Gurion University of the Negev, Israel

Dr Dov Pasternak	Head, The Institute for Agriculture and Applied Biology/ Steering Committee Member
Mr Moshe Amir	Director, Research Contracts

Ministry of Agriculture and Land Reclamation, Egypt

Dr Youssef Waly	Minister, Deputy Prime Minister
Dr Adel El-Beltagy	Director, Agricultural Research Center/ Steering Committee Member

CALAR II Project Personnel, Israel

Dr Dov Pasternak	Project Coordinator, Israel (also listed above)
Dr Beni Aloni	Volcani Institute
Dr Asher Bar-Tal	Institute of Soil and Water, Bet Dagan
Mr Yoel De Malach	Director, Ramat Negev Research Station

Mr Uri Drori	Engineer, NIFLA Limited
Mr Beni Gamliel	Extenson Service, Peppers
Dr Samuel Mendlinger	Ben-Gurion University of the Negev
Dr Yosef Mizrahi	Ben-Gurion University of the Negev
Dr Meir Pilowski	Field Crops Institute, Bet Dagan
Dr Eitman Pressman	Field Crops Institute, Bet Dagan
Dr Irit Rylski	Field Crops Institute, Bet Dagan
Dr Ruth Shillo	Ben-Gurion University of the Negev

CALAR II Project Personnel, Egypt

Dr Adel El-Beltagy	Project Coordinator, Egypt (also listed above)
Mr Abou El-Fotouh Abdalla	National Research Center
Dr Samir Osman El-Abd	National Research Center
Dr A M Abdel-Mawgovd	National Research Center
Dr Ayman Abou-Hadid	Ain Shams University
Dr Usama El-Behairy	Ain Shams University
Dr Hamdy El-Doweny	Agricultural Research Center
Dr Mohamed Edris	Al-Azhar University
Dr Abdel-Ghany El-Gindy	Agricultural Research Center
Dr Mahmoud Hafez	Agricultural Research Center
Mr Mahmoud Hassanein	Agricultural Research Center
Dr Hosny Khalifa	Agricultural Research Center
Dr Abdel Muhsen Khalil	Agricultural Research Center
Mr Mahmoud Medany	Agricultural Research Center
Mrs Atiat El-Menshawy	Ministry of Agriculture
Dr Salah Mohamedien	Agricultural Research Center
Mr Samir Ragab	Agricultural Research Center
Dr Tarek El-Raggal	El-Sobhia Institute
Dr Hamed El-Saeed	Agricultural Research Center
Dr Gad El-Rab Salama	Agricultural Research Center
Mr Mohamed Saleh	Agricultural Research Center
Mr Mohamed El-Shenawy	Ain Shams University
Dr Abdel-Aziz Sheta	Ain Shams University
Dr Sayed Singer	Agricultural Research Center
Dr Saeed Zakariah	Agricultural Research Center

CALAR II U.S. Collaborators

Dr Basil Acock	USDA, ARS
Dr James Beutel	University of California, Davis
Dr Theodore C Hsiao	University of California, Davis
Dr Richard Jones	University of California, Davis
Dr Robert McMahon	Ohio State University
Dr Ted Short	Ohio State University
Dr Michael Shannon	USDA Salinity Laboratory, Riverside, CA

TECHNICAL REPORT OF DR. EARL LENG

The scope of work for the Research Cooperation Specialist/Team Leader charged him with certain specific evaluation tasks, in addition to his overall responsibility for finalizing the review report This "technical report" focuses only on these specific tasks, generalized observations are included in the joint team statements in the main report

A ATTAINMENT OF OVERALL PROJECT OBJECTIVES

The approved scope of work for CALAR II specified that the main goal of the project was to develop protected agriculture in both countries, through cooperative efforts Building on the structure created by CALAR I, the present project has clearly made significant progress toward this goal Obviously, the limited levels of funding and research efforts supported by CALAR II cannot be credited with all the significant progress that has taken place in protected agriculture in Egypt and Israel in the past few years However, there is ample evidence in both countries that CALAR II research is yielding results directly applicable to practical problems of protected agriculture, and that mechanisms have been established for rapid transfer of these results to operating activities on a commercial scale

The approved scope of work specified three additional major project objectives which will be discussed following

1 Expanding cooperative applied research efforts between Egypt and Israel.
While CALAR I created an effective framework for cooperation between Egyptian and Israeli agricultural scientists, minimal attention was given to the significant field of protected agriculture CALAR II, with its focus on this area, has resulted in much enhanced cooperation between the two nations In particular, at the beginning of the project, Israel already had a well-developed industry, utilizing protected agriculture for the production of a major volume of ornamentals, vegetables and melons for export to European markets In contrast, this industry was then much less developed in Egypt CALAR II has promoted vigorous research collaboration between the two countries in an area of mutual interest This is leading to accelerated development of vegetable and melon production, under protection, in Egypt, and also to broadening of the research base as it pertains to Israeli problems

2 Improvement of the socioeconomic status of farmers and growers in the participating nations. Adequate quantitative measures were not available to the review team for determining the degree to which this objective may have been attained

3 The development of new productive lands and the preservation of fragile ecosystems in those lands. This objective is applicable to both countries, with rather different specific aspects in each CALAR II research appears to be playing a significant and positive role in logical and sustainable new-land development in both countries In Israel, population pressure is causing a shift in agricultural production toward the Negev Desert Water is in short supply and expensive there CALAR II research is emphasizing production under protection as a means of maximizing water-use efficiency, particularly in the successful utilization of saline or brackish ground water Egypt is using this research to guide conversion of sand-over-saltpan culture to more effective and water-use efficient cultivation under protection Also, as mentioned above, the national program of allocating new-land tracts to agricultural graduates for small-farm enterprises is expected to be assisted by CALAR II techniques for appropriate types of protected cultivation

B RELATION OF PROJECT PERFORMANCE TO PLANNED IMPLEMENTATION

The project has achieved excellent progress toward all planned research objectives, except those related to marketing and postharvest utilization Priority of these latter topics has been considered to be lower than production-oriented topics While this can be considered logical in the current status of development of protected agriculture, it appears important that more attention be paid to postharvest handling, particularly in Egypt Israel already has a highly developed system for processing and marketing crops produced in protected environments, especially for vegetables, fruits and ornamentals exported to Europe

The planned schedule of annual scientific workshops/internal reviews has been met, with the third such meeting being held at Alexandria, Egypt, March 8-11, 1993 Previous workshops were held in San Diego, California and Beer-Sheva, Israel

C EVALUATION OF PROJECT MANAGEMENT

At all levels, project management appears to be both effective and efficient SDSU Foundation has provided excellent overall project administration, maintaining close ties with program leaders in both participating countries Personal relationships among managerial personnel also appear to be excellent The technical report of Dr Moore contains further comments on internal project management

D SUPPORT BY HOST GOVERNMENTS

Continuing the highly-effective governmental support evidenced in CALAR I, the Governments of both Israel and Egypt have strongly supported the objectives and operations of CALAR II Despite recurring periods of political tension in the region, support for this project from both Governments has been enthusiastic and steadfast

In Israel, Dr Samuel Pohoryles, a senior official in the Ministry of Agriculture, and a Steering Committee member, has been a firm supporter of both CALAR projects and of other regional cooperative programs since the planning for CALAR I began, and maintains his direct interest in the project to the present time Dr Dov Pasternak, Director of the Boyko Institute of the Ben-Gurion University of the Negev, has been Project Coordinator for Israel from the beginning of CALAR I, and has insured the active support of the project by his University and by other major agricultural research agencies

In Egypt, Dr Adel El-Beltagy, who has held various senior posts in the Ministry of Agriculture and Land Reclamation and is currently Director of that Ministry's Agricultural Research Center, has been Project Coordinator and Steering Committee member of both CALAR I and CALAR II, and has marshaled excellent support from all pertinent arms of the Egyptian agricultural research establishment Dr Youssef Waly, Minister of Agriculture and Land Reclamation, reiterated his strong support for CALAR II at a meeting with the current review team March 11 of this year

In concrete terms, both Egypt and Israel have made available to the project a wide roster of their most able agricultural research workers Both countries have also provided extensive physical facilities for project activities, at minimal direct cost to the project Indirect costs drawn from the project are at modest levels in both countries

E SUPPORT BY A I D , THE CONTRACTOR, AND U S COLLABORATORS

CALAR II has been adequately supported by AID/Washington, as regards timely obligation of funds and other significant actions This is a favorable contrast to the situation of CALAR I, where funding delays impeded project start-up operations

USAID/Cairo and the American Embassy/Tel Aviv have had only modest direct involvement in CALAR II, since it is a regional project However, both agencies have been generally supportive of the project

The Contractor, San Diego State University Foundation, must be credited with superior performance for overall project administration and support In particular, the Project Coordinator, Dr Mohamed El-Assal, has provided highly effective and timely handling of the complicated details of this project

In general, support by U S collaborators has been good, particularly in regard to their participation in the annual scientific workshops and internal reviews There appears to be somewhat less relationship between actual research activities of the U S collaborators and CALAR II programs than may be desirable This is of course not surprising, since no CALAR II funds are available to support research in the U S However, the project management team may wish to expand the roster of U S collaborators

F STATUS OF PEER REVIEW

In a change from the situation in CALAR I, the approved CALAR II work plan called for the establishment of in-country Peer Reviews in both Egypt and Israel The grant document for CALAR II specifies that "a system of Peer Reviews shall be established" to review detailed research protocols prior to the approval of any sub-project and to participate in periodic evaluations This system was intended to involve Peer Review members "independent from the Program and its related organizations "

In practice, peer reviewing of CALAR II research has been carried out by an essentially internal system, involving the Program Steering Committee and the Program coordinators This system was outlined in the original project proposal, developed by the tripartite design team In this system, the Steering Committee and Program Coordinators annually review all proposed scientific work plans and work out with each scientist the final approved plan of activities Reports submitted by

evaluators, especially including the U S collaborators, are taken into consideration in this annual review process In addition, the Annual Scientific Workshop serves as an effective peer review mechanism

In the opinion of the present evaluation team, the review system actually being employed in CALAR II is working well and is free from any undue bias The team doubts that an appropriate Peer Review group not affiliated with CALAR II could be organized either in Egypt or Israel, most particularly in the latter country, where the majority of agricultural scientists well qualified in research on protected agriculture are involved in CALAR II

G RELATION OF EXTERNAL EVENTS TO COOPERATION

Severe external constraints to cooperation between Egypt and Israel have existed since the inception of CALAR I, and have continued through the life of CALAR II Essentially, these constraints arise from the political tensions between Israel and its neighboring Arab countries These tensions wax and wane as specific situations arise, but have presented a major barrier to full cooperation since these programs were formulated It is apparent that the CALAR projects themselves have made at least some contribution toward lessening these tensions, and it is clear that mutual cooperation has been much improved since CALAR I began operations

H GENERAL COMMENTS ON REGIONAL PROJECTS

This evaluation did not include attention to other regional projects in the area, or to the concept of regional AID projects in general However, two evaluation team members (Leng and Moore) have had extensive prior experience with AID programs in the region and with the regional project concept It is our opinion that regional projects of this type in the Middle East, and the CALAR and Maryut projects specifically, are highly effective and deserving of increased AID support

By any standards of evaluation, CALAR I was very successful in attaining project goals, particularly those related to cooperation CALAR II appears to be even more successful, both because it is more narrowly focused and because 10 years of experience have led to a high degree of trust and cooperation among administrators and scientists involved

We therefore conclude that the concept of focused, well-organized regional projects is sound and should be promoted

TECHNICAL REPORT OF DR FRANK MOORE

I INTRODUCTION

This "Technical Report" follows the outline for a mid-term evaluation of specific tasks set at page 3-4 of the Scope of Work (SOW) (Appendix 1) These tasks can be grouped in the following categories

1 Organizational Structure
2 Contact Arrangements
3 Staffing
4 Reports
5 Project Administration
6 Economic Potential and Benefits
7 Environmental Impact

The SOW specifies that these tasks will be analyzed and measured The data available, however, allow only descriptive analysis Little or no information is available which could serve as a base from which--or as target towards which--progress could be measured The Log Frame does not readily serve that purpose nor do there appear to be 5-year work plans or "rolling" annual plans which would permit quantified appraisals of progress Such plans would have to be prepared separately for each country, because they must be responsive to the different settings in Israel and Egypt in which common problems of protected agriculture must be addressed

These observations should not be misinterpreted They do not reflect misgivings or concern about the progress of the demonstrable usefulness of the Project The comments are made merely to draw attention--as will be done under Reports below--to the fact that the ongoing monitoring and periodic reviews would be facilitated by a quantifiable format

II BACKGROUND

An evaluation of the administrative aspects of CALAR II requires a clear understanding that there are differences in the setting of the project in Israel and Egypt The principal of these are

A THE STRUCTURE OF AGRICULTURE

Agriculture in Israel follows essentially a socialistic pattern The principal producers are the Moshavim, cooperatives of relatively small holders following, as individual farmers, a common plan and drawing on common infrastructure for services Major farm equipment and marketing services, for example, are provided by the community, as is required production credit The individual production units are not geared to maximizing efficiencies of scale Kibbutzim (collectives) also are important

Egyptian farming is carried on almost exclusively by private farmers of operating units in a wide range of sizes In terms of cultivated acreage, especially on the so called New New Lands (the newly developed drip-irrigated areas on the western fringes of the Nile Delta), large and very large owners predominate and rely on their own capital to develop the land Mention, however, needs to be made of "graduate settlers " These are university graduates who are being "staked" by the Government to settle on five feddan (5 acre) units of newly developed lands About twenty thousand of these have already been settled on some 100,000 acres, and plans are in hand for many more in the near future

B RESEARCH ORGANIZATION

In Israel, the research work of the Project is essentially conceived and directed by the Project Coordinator, in consultation with professional colleagues It is carried out by two research centers, the Agriculture Research Organization, the Volcani Center at Bet Dagan, and the Institute of Applied Research at Ben Gurion University of the Negev at Beer-Sheva

For reasons presumably related to the size of the research establishment, as well as in line with administrative tradition, execution of the Project is more formally structured and monitored in Egypt The Project Coordinator is also the Director of the Agricultural Research Center, the umbrella organization for the Research Institutes of the Ministry of Agriculture The Coordinator is backed by a 40-member National Committee for Protected Cultivation, of which he is a member The Committee is chaired by the Under-Secretary of the Ministry of Agriculture responsible for Horticulture The Committee members represent all major government agencies relevant to the Project, including the four universities most directly concerned with the development of protected agriculture The Committee meets weekly

In considering these differences in the formal structure of the Project implementation, it is well to keep in mind that Egypt has a research establishment of more than 4,500 persons at the Ph D level as compared to a few dozen in Israel

This size difference alone would necessitate a more formal structure for the Egyptian side of the Project for reasons of equity and efficiency

C RESEARCH THRUST

The main goal of the CALAR II Program is to cooperatively develop means of using protected cultivation to produce horticultural products for export, as well as for domestic consumption

For a variety of reasons, the immediate thrust of the research in the two countries, while consistent with this overall mandate, differs in relative emphasis on production for export and for domestic sales

In Israel, the internal market for fruits and vegetables is adequately supplied The output of protected agriculture is, therefore, primarily for export and directed at maximizing foreign exchange earnings in competition with established producers in Holland, Spain and Morocco

In practice, this requires production for market niches in Europe to meet "off season" needs (e g tomatoes, melons and peppers in the winter months) or to introduce and thus get a lead in new high value crops, such as new types of vegetables, fruits, and flowers

Israel, as a high cost producer, operates at the economic margin and must maintain or improve its market position by improved efficiency and constant re-alignment of production in response to changing market conditions

In Egypt, there continues to be a sizable internal market capable of absorbing and indeed requiring significant increases in domestic production Vegetable prices have increased three-fold in the last few months At the same time exports are also needed to achieve net overall self-sufficiency in the agricultural sector Primary initial emphasis on improved production to meet the requirements of local consumers is a valid immediate objective of the Program To the extent that protected agriculture increases the availability of vegetables for domestic consumption, this objective is consistent with the CALAR II goal Protected agriculture increases the capability to adjust production schedules to market needs It thus helps to avoid the seasonal gluts and shortages which contribute to economic inefficiencies in Egypt Increased competition in the European market

has led Israel to shift its research emphasis from tomatoes--increasingly available from lower cost producers--to mid-winter melons, sweet peppers and a variety of exotic vegetables and fruits, such as the Kiwano Flowers do not appear to be given as much research attention as warranted by their economic importance They account for about half the value of the protected agriculture production, but within the CALAR II Program, do not receive commensurate research support

Egyptian agriculture is not operating near to the economic margin Egypt can afford to make quantity a primary objective of its protected cultivation, especially in the context of phasing production to even out demand and supply throughout the year The Egyptian research program is, therefore, especially engaged in work directed at the local market for tomatoes, melons and green beans, and recently oyster mushrooms

Related to the question of research thrust is the economic viability of production In Israel, protected agriculture is competitive only with substantial subsidies to producers and these can be justified in terms of foreign exchange requirements In Egypt, there is ample scope for returns on investment for domestic production without subsidies other than what might be provided for land acquisition and development

III EVALUATION OF CALAR II ADMINISTRATIVE AND ECONOMIC ASPECTS

A ORGANIZATIONAL STRUCTURE

CALAR II continues the organizational structure initiated and tested over the years of CALAR I This structure has proven itself and serves the interests of all participants, including that of USAID, the Program's sponsor Indeed, the organizational structure has been significantly strengthened by continuity and growing mutual professional and personal confidence between all parties involved The structure is flexible, and allows each of the parties--SDSU Foundation and the Governments of Israel and Egypt--to organize itself along lines that best reflect its cultural and administrative setting This assigns the greatest individual responsibility to the Israeli Coordinator It gives the Egyptian Coordinator considerable flexibility within a customary administrative support structure set up to conciliate the views and needs of the wide range of institutions involved in the execution of the Program The SDSU Foundation falls between the organizational pattern of the Israeli and Egyptian components

B CONTACT ARRANGEMENTS

These also continue the practices developed under CALAR I and have proven themselves practical and efficient over the course of that Project

On a narrowly technical level, there is direct contact between the researchers in both countries Matters relating to policies or questions of funding or interpretation of contracts, are handled by the Country Coordinator and the SDSU Foundation Coordinator, or through the SDSU Foundation Coordinator where matters affect both participating countries

Where questions arise relating to the overall concept of the program, these are referred to the Project Steering Committee on which all parties are equally represented In all matters pertaining to USAID, SDSU Foundation is the organizational link, so that programs in the field are not under direct operational supervision of US field staff

C STAFFING

1 **Technical Qualifications of Personnel** The research staff in both Israel and Egypt is technically fully qualified to perform their responsibilities in pursuit of the program objectives It is worth noting that much of the staff in both countries consists of young Ph D s They benefit from their involvement in important research activities in close collaboration with senior scientists in their own country, and with colleagues across the border and in the United States They carry a full load of responsibility for research, while simultaneously broadening substantially their professional skills and experience in scientific collaboration

2 **Staffing Performance** Performance is on target when compared to approved staffing plans and requires no special comment

D REPORTS

The reporting and evaluation procedures set out in section IV of Attachment 1 to Grant ANE-0158-G-00-0017-00 are adequate to provide meaningful monitoring of the project

From working papers and through conversations, it has become clear that the Project Coordinators are fully informed about the substance of the information

required in the periodic reports and provide the ongoing monitoring needed to keep the activities on track However, formal reporting procedures are not as fully implemented with respect to type and timing of submissions as required by the Program Documentation

To give the activities a broader exposure and to provide information to interested parties beyond those directly involved in the Project, more rigorous compliance with established procedures for reporting seems important

The preparation of reports at all levels of the project would be facilitated by the development of a standard format and schedule for each of the required reports This would make preparation of the reports easier and would permit comparison of different activities carried out within each country and between countries

1 Effectiveness of Administration and Personnel The level of effectiveness in all aspects--both substantive and logistic--is high and requires no special comment in this evaluation

2 Funding Flows Actual funding flows match funding plans and require no special comments within the framework of this evaluation

E ECONOMIC POTENTIAL AND BENEFITS

1 General There are great potential benefits to the Israeli and to the Egyptian population and, more broadly, to the national economy of each country Both countries benefit from research findings which lead to

- The expansion of areas under cultivation,
- More efficient use of water,
- The effective extension of the growing season made possible by application of research findings generated by the Project

Apart from that, the nature of the benefits varies between the countries This evaluation defines rather than quantifies these benefits In Israel, the program principally increases the quantities of high quality products that can be exported to Europe to fill specific and clearly identifiable niches in a highly competitive market Apart from employment and income directly generated by more widespread protected agriculture, the benefits to the Israelis accrue to the national economy rather than more directly to the producers or consumers In

this connection, the impact on national resource allocation of the subsidies required to sell Israeli off-season vegetables in the highly competitive European markets need to be closely examined The long-range impact of distortions in the pattern of resource allocations needs to be evaluated on the basis of different assumptions with regards to market prices and levels of public and private support of the Israeli economy

In Egypt the Project impacts more directly on the general population and on the domestic economy Research is directed, in the first instance, to the increase of production for the local market and to a lesser extent only to export, especially to the highly sophisticated Western European markets

The increases in income to participating farmers and to GDP are likely to be substantial The production techniques developed under the CALAR II Program in protected agriculture are significantly more efficient than current cultivation practices for the same crops in open fields or under cover

If properly extended--as they now seem to be--the research findings will permit a pattern of production more responsive to the pattern of demand throughout the year This will help to avoid the alternating gluts and shortages that are costly to consumers and wasteful of agricultural resource inputs

Once production expands beyond local consumption needs, a market may be found abroad beginning with increased sales to countries in the Middle East and the former Iron Curtain countries where Egypt already has some experience Beyond that, Egypt benefits directly from the CALAR project research by using the findings in a program which assists in settling recent university graduates on 5-acre units of newly developed land

2 **Domestic Consumption** There is little need for protected cultivation to provide food for domestic consumption in Israel Agriculture there is essentially self-sufficient As for Egypt, the Project can make a substantial direct contribution to the supply of food for domestic consumption It extends the growing season for important crops for the domestic market by three to four months and develops a greatly more productive technology than that currently practiced in field agriculture

3 **Exports** This has been covered in earlier parts of this section It has been shown that virtually the entire increase in output of protected agriculture in Israel is produced for export In Egypt, there remains an unsatisfied demand for horticultural crops that can and should be met from additional domestic

production Once these domestic market needs are satisfied, surpluses for export will increasingly become available and markets for them will have to be found Entry into the markets in which experienced and subsidized producers of high quality agricultural crops now compete is likely to be difficult and costly Egypt may, therefore, first seek higher sales in the markets of the Middle East and the former Iron Curtain countries which it is already serving to a limited extent and expand into areas of greater competition only when experience has been gained in meeting exacting time schedules and rigorous quality standards

In this connection, it should be pointed out that under normal circumstances, the tourist industry served by international class five-star hotels provides a captive export-equivalent market which could serve as a test for marketing approaches for top quality products under quasi-export conditions

4 **Farmer Status** Views on this topic are inevitably highly idiosyncratic and may not serve an objective evaluation As a general comment, it is likely that farmers and growers will derive improved socio-economic status commensurate with the economic success associated with their participation in protected agriculture

F ENVIRONMENTAL IMPACT

The ecological impact of the introduction and dissemination of new or improved varieties and technologies will, at worst, be neutral and, in practice, most likely highly positive The new technologies will lead to more efficient allocation of severely limited land and water resources and will lessen the pressure of demand and associated abusive and hence damaging exploitation

For a variety of reasons the impact on the Israeli ecosystem of the Project will be less than in Egypt The principal of these reasons is that modern agriculture started in Israel only relatively recently and could thus be developed with awareness and sensitivity to the needs of maintaining and improving ecosystems using current technology Egyptian agriculture has a tradition of millennia during which consideration of ecosystem maintenance was largely irrelevant They became acute only with the population explosion associated with rapid decrease of per capita availability of agricultural land, coupled with the profound changes in the ecosystem resulting from the Aswan High Dam Before then the annual flooding of the Nile protected the land from excessive salinization The CALAR scientists are sensitive to ecological issues and the technologies developed under CALAR II are responsive to ecological considerations To the extent that these technologies

can be adapted and transferred from protective structures on desert land to field cultivation by farmers in the Delta, they will have a positive impact on the Egyptian ecosystem

IV CONCLUSION AND RECOMMENDATIONS

An evaluation of the administrative aspect of CALAR II can be summarized simply

- The project has a good and effective organization, tested in CALAR I and found to be well suited to the needs of the successor project in protected agriculture

- The administrative and professional staff of the three participating countries are well qualified and highly committed As far as available documentation permits, the project appears to be on schedule, but, it is in this area that some specific recommendations may be in order These focus on the need to clearly show what has been accomplished and what remains to be done to persons not directly involved in the day-to-day operations of the Project

- Foremost among these recommendations is the need to develop standard formats and schedules for each report required and to have these reports submitted from Egypt and Israel on time To avoid needlessly raising hackles, it should be stressed that a well-designed format will not bureaucratize the reporting process but will make it easier and more informative

- Country Coordinators should be requested to submit draft formats to the U S Coordinator no later than 60 days after distribution of this Evaluation Report

- The US Coordinator should then reconcile the draft formats received from Israel and from Egypt Unless there are major discrepancies between the country drafts, he should circulate actionable copies to the Country Coordinators by Fax for immediate implementation

- Each Country Coordinator may also find it helpful to develop a standard reporting format for proposals and progress reports by the Principal Investigators

- Program performance reports should be distributed widely and, specifically, to all professional, technical and administrative staff in Egypt, Israel and the U S

- The semi-annual report of September 30 should be consolidated with the Annual Report due on that day

- Periodic reports should be distributed no later than half-way through the subsequent reporting period

- Discussions at the Annual Workshop showed that the PIs and Country Coordinators know the economics and economic implications of the research Information on costs and potential returns should, however, be specifically included in research design and reports wherever practicable Economic aspects should not be simply ignored in formal Project Documentation Responsibility for proving the irrelevance of economic data and omitting them in reports should rest with the PI and/or Country Coordinator

- In addition to the considerations immediately above, research pertaining to the economics of protected cultivation should be undertaken over the second half of the Project either separately or as part of current scientific research

  The rationale for Project extension or follow-up must have some clearly defined and, to the extent possible, quantified economic justification

- Closely related to this recommendation is the need to include sustainability criteria even in technical research

- Lastly, especially in Egypt, where the domestic market is an important beneficiary of the research findings of CALAR II, it may be useful to begin planning for an extension of research with USAID or other funding to questions of increasing value added through postharvest activities such as field cooling, storage, processing, and marketing of production

TECHNICAL REPORT OF MARY PEET

I INTRODUCTION

The main goal of the CALAR II program was to cooperatively develop protected agriculture in Israel and Egypt This development is expected to increase exports from Israel, and to increase the domestic food supply in Egypt Specific areas in which development research was expected to concentrate were agromanagement, environmental modification, structure selection, genetic modification and postharvest

II. METHODOLOGY

A PROGRESS IN THE ABOVE AREA IS EVALUATED BY

1 Review of abstracts and talks presented at CALAR II 3rd Annual Scientific Workshop, Alexandria, Egypt, March 8-11, 1993 Review of corresponding project proposals, annual reports and published articles

2 Site visits in Israel to Ben-Gurion University of the Negev, Volcani Center, Ramat Negev Experimental Station and Habesor Research and Development Unit

3 Site visits in Egypt to the Vegetable Research Department, College of Agriculture, Ain Shams University, Agricultural Research Center protected agriculture site at Dokki, Cairo, The Ministry of Agriculture Research and Training Site, Dokki, Cairo, and El-Bousseily Research and Training site near Alexandria

4 Informal exchanges with U S , Israeli and Egyptian scientists before, during, and after the Workshop

B THE TECHNICAL REPORT IS STRUCTURED AS FOLLOWS

For each of the areas of expected research concentration (agromanagement, environmental modification, genetic modification, structure selection, and post-harvest) research in each country is summarized A subjective evaluation is given of its relevance to the project aim of developing protected agriculture in Egypt and Israel A further subjective evaluation is given of the contribution of the research to advancing the state-of-the-art research in protected agriculture world wide, i e , its intrinsic scientific merit These evaluations are of necessity incomplete, because

they are based on only research reports from the 3rd Workshop That is, material from the 1st and 2nd Workshop is not included Nevertheless, since the 3rd Workshop represents the Project mid-point, it presumably builds on progress made in the first 2 years of the project and serves as a guide to future research directions Following the categorized research evaluations, general comments are offered, especially on the contribution of the project to expanding cooperation and improving relations between the cooperating scientists Finally, suggestions are offered for possible areas of improvement

III RESEARCH CATEGORIES

A AGROMANAGEMENT

1 Egyptian Research

Egyptian Research Reports in agromanagement ranged from growth regulator and salinity research to modeling water usage in computer-controlled greenhouses Ten of sixteen Egyptian papers fell in the agromanagement category, reflecting a perceived necessity for baseline feasibility and cultural practice studies The crops represented were cucumber (7), tomato (2), melon and pepper The scientific topics being addressed included ways to overcome salinity effects, grafting to overcome disease problems, use of growth regulators and actions to overcome salinity and cold stress and to increase rooting, water usage in greenhouses, and cultivar evaluations

Although minimizing water usage and increasing plant growth in saline and nematode-infested soils or at low temperatures are important, with the exception of the grafting study, no information was presented in the abstracts or papers themselves as to whether the proposed techniques (if successful) would represent a cost-effective and safe means of overcoming these problems Presumably scientists in each country are in close contact with their own extension workers and farmers and are in the best position to judge the cost-effectiveness and practicality of their experimental treatments Nevertheless, it would facilitate the evaluation process and also improve the usefulness of the data to the cooperating scientists if a short statement could be made, preferably in the abstract, in which the research is placed in the context of its relevance to the development of protected agriculture

In some studies, of course, the research may be more directed towards answering basic questions about salinity, cold stress, etc Again, however, stressing the context of this research in relation to current scientific hypotheses would make the abstracts and research reports more accessible to participants

who may not be familiar with current work in growth regulators or stress, for example This would not be as important if papers were presented in sessions entirely devoted to a single topic such as growth regulators, but in a general session, a few prefatory remarks or slides would be useful These contextual remarks may indeed have been planned for this workshop, but deleted when the talks were shortened The contextual material should, however, also appear in brief form in the abstract

Other areas of present or planned research in protected cultivation mentioned by Dr Abou-Hadid in his introductory remarks, but not addressed by specific papers were 1) Soil amendments, such as locally available vermiculite, to amend heavy clay soils, 2) Use of recirculating sand culture to conserve nutrients and reduce run-off (including the use of palm fibers to improve aeration), 3) Use of composts and Integrated Pest Management practices to produce chemical-free vegetables, 4) Use of locally available fertilizers in nutrient film technique (NFT) hydroponic systems to reduce dependence on the expensive imported fertilizers designed for NFT, 5) Growing chicory and lettuce in low tunnels, 6) Use of aeroponic techniques for strawberries, lettuce and chicory, 7) Substituting heat exchangers which should service up to eight greenhouses for air heating systems installed separately in each greenhouse, 8) Comparison of single and multispan greenhouses and development of design features which would allow both adequate cooling and adequate resistance to high winds (up to 160 Km/h), 9) Introduction of new crops for protected cultivation such as cherry tomatoes, strawberries, and ornamental gourds

In the area of postharvest physiology, Dr Abou-Hadid pointed out that there were many problems, but resources are inadequate to address them at this time The one quality problem specifically addressed was environmental modification to prevent puffy fruit in tomato

As a general comment on this research, it was well-planned and well-conducted, with adequate replication and using appropriate equipment and techniques The authors seemed aware of current scientific literature in the area These points were, however, more apparent reading the associated papers than from the abstracts and presentations Suggestions are offered later in this report as to standardization of the abstracts The talks at the Workshop were shortened from 30 to 15 minutes, so it is not surprising, perhaps, that some material was deleted The presentations and abstracts are an international showcase for CALAR scientists, particularly young scientists, so as much attention as possible should be given to presenting experimental rationale and results clearly

2 Israeli Research

Only 3 of the 13 Israeli papers dealt with agromanagement These papers focus on the necessity for the export market of producing top quality Manipulations of plant architecture, density, and root and shoot environments are designed to improve fruit size and sugars in tomatoes and melons and to prevent physiological disorders in peppers At the same time, however, interesting scientific questions were being asked in the areas of root/shoot interactions, partitioning and physiological disorders were clearly presented in the abstracts and the Workshop presentations This information should have been accessible to all participants, whatever their research backgrounds

B ENVIRONMENTAL MODIFICATIONS

1 Egypt

The one paper presented by Egyptian scientists in this area looked at growth and yield of cucumbers when various kinds of plastic mulches and low tunnels were placed inside unheated plastic houses to raise temperatures Assuming the use of interior plastic mulches and tunnels is more cost-effective than heating, the work represented in this paper should be an effective approach Presumably the reasons why there were not more papers in the area of environmental modification were 1) Most greenhouses have only passive heating and cooling systems, so in practice the greenhouse environment is not modified by the farmer 2) The optimal growing temperatures and other conditions for greenhouse vegetables have already been well-described in work elsewhere or previous work here

2 Israel

There was also only one paper presented by the Israeli scientists directly in this area, presumably for the same reasons discussed above This paper compared pepper production and quality for export in greenhouses heated at night to two different temperatures In the Israeli work, as in the Egyptian, the basic assumption is that greenhouses are unheated, and research is directed towards questions of situations in which night heating can be justified or in breeding work to improve the cold tolerance of melons (see genetic modification), solar designs which can be used for night heating (see greenhouse), or how physiological disorders caused by low night temperatures can be reduced (see agromanagement)

As with the work in Egypt, these studies seem focused on cost-effective solutions to problems of wintertime production in unheated plastic greenhouses Presumably, as in the Egyptian studies, the economic trade-offs between heating and not heating are already known

C STRUCTURE DESIGN AND SELECTION

1 Egypt

This issue was not specifically addressed by the Egyptian Scientists at the workshop, although reference was made to work being done to prevent insect entry with nets and to increasing natural ventilation by design modification

2 Israel

Two papers described passive solar designs to cool during the daytime and heat at night These designs would use water-filled pillows, reflective screens and evaporative colling to maintain good growing conditions for plants under conditions of high daytime temperatures and low night time temperatures With modifications, the design could be used both under the too cool winter conditions and the too warm summer conditions Although this is described as an inexpensive solar greenhouse, certain elements are quite sophisticated, such as the proposed use of CO_2 enrichment to allow plants to tolerate higher temperatures These high temperatures in the daytime are, in turn, necessary to charge the solar collectors (i e , the water-filled pillows) so that enough energy is re-radiated at night to heat the greenhouse A CO_2 supply is already available on the Moshavim as an industrial by-product and could be added inexpensively CO_2 enrichment normally, however, also involves rather expensive infra-red gas analyzers and control computers, such as those installed in the Beer-Sheva research greenhouses It is not clear if this control equipment would be cost-effective on unheated houses, but again the project personnel in each country are in the best position to make these judgments The design of the solar greenhouses is, however, intrinsically interesting and very innovative Little research has been done on greenhouse design for arid lands or on designs for constructing inexpensive, unheated greenhouses Since the cost of heating is significant, and in most cases evidently prohibitive in both countries, this is a logical area to concentrate research and development efforts

D GENETIC MODIFICATION

1. Egypt

One of the Egyptian papers presented dealt with breeding for powdery mildew resistance in cucumbers and a second paper discussed ethrel as a screen for salinity tolerance of soybeans Breeding for powdery mildew resistance should

be very valuable, not only for protected agriculture where powdery mildew is serious problem in cucumbers and melons but worldwide in open field cultivation as well The associated physiological studies on the correlations with polyphenol oxidase, peroxidase and soluble solids were also interesting While the conclusions are limited since only two cultivars were compared, the work is nevertheless very promising It should be noted that the CALAR II breeding program was based on genetic material and especially tomato lines developed in CALAR I

2 **Israel**

Genetic modification is an area of high priority for Israeli researchers, as demonstrated by 4 of 13 papers falling in this area, the largest single crop concentration being melons for export These 3 melon projects combine a genetic approach with carbohydrate metabolism studies, ideotype development for stress-tolerant melons, correlation of cold tolerance with the appearance of particular cold shock proteins and measurement of sucrose and total soluble solids in melons in unheated greenhouses This work is very impressive because it combines a focused, practical goal with modern protocols and an innovative, intellectually exciting approach The fourth study deals with breeding tolerance to tomato yellow leaf curl virus (TYLCV), which is vectored by the tobacco or sweet potato whitefly, Bemisia taboci Genn , common throughout the Middle East Whiteflies are, in fact, a problem in tropical and subtropical areas worldwide The TYLCV project is a classical breeding study that appears to be making significant progress not only on TYLCV, which is a problem in both countries, but in resistance to the insect itself, an extremely difficult, but highly desirable goal

E MARKET ANALYSIS AND PORTHARVEST RESEARCH

1 **Egypt**

Only one postharvest paper and no market analysis papers were given at the workshop by Egyptians However, information was presented by a number of talks both by Egyptian and Israeli scientists on the prices particular crops would bring in the market relative to their cost production at various times of the year Thus, at least informal market analyses have been conducted for many of these crops in both countries The postharvest paper consisted of a packaging study on tomatoes In his introductory remarks, Dr Ayman Abou-Haid said that the need for postharvest research was great in Egypt but that the resources were not currently available to make a major research effort

2. Israel

As in the case of Egypt, only one postharvest paper and no market analysis papers were given at the Workshop by the Israelis The Israeli study dealt with artificial ripening of kiwano using ethylene In the case of kiwano and other exotic fruits, ripening information is not available and needs to be investigated The Israeli studies aimed at improving fruit soluble solids could also be considered as port-harvest studies, since they certainly would improve the quality of the produce reaching the consumer

F FLORICULTURE AND NEW CROPS

1 Egypt

An excellent Egyptian presentation in this area was on using legume residues as well as straw to culture oyster mushrooms The profit margin seems very high in this production system, so this research should be very important commercially This research also points out the potential for culturing other types of commercially valuable mushrooms, now that expertise has been developed on this project This field not only has tremendous commercial potential for the export market, but little work has been done anywhere in the world on agromycology, so there is little danger of duplicating research conducted elsewhere

2. Israel

Similar considerations of breaking new ground apply to the Israeli work with pollination biology of Hylocereus and the development of Heliconia as a new flower for export, although the market potential is, of course, hard to predict over time for either of these crops An overview of floricultural research in Israel was presented but no abstract was included in the Workshop Proceeding A 1991-1992 annual report indicates that work focused on daylength requirements for Lisianthis and Asclepias and the use of GA3 to improve flower stem number after removal from cold storage in Eryngium.

IV EXAMPLES OF COOPERATIVE EFFORTS IN CALAR BETWEEN EGYPTIAN AND ISRAELI SCIENTISTS

As would be apparent from the above discussion of Egyptian and Israeli research in agromanagement, greenhouse design, environmental modification, genetic modification, market analysis, postharvest research, floriculture and new crops, Israeli and Egyptian scientist have taken very different approaches to protected agriculture research Egyptian efforts are concentrated in 2 areas modeling water usage in greenhouse and overcoming cold and salinity stress in greenhouses using various

sprays The Israelis, on the other hand have concentrated on low-cost solar greenhouse designs and on improving fruit quality for the export market Thus there was relatively little overlap in the subject matter of the Israeli and Egyptian presentations This lack of overlap is not unexpected because of the already-discussed differences in marketing strategies of greenhouse operators in Egypt and Israel In addition, there is a natural desire on both sides to follow up on perceived strengths in various research disciplines, to use existing equipment and collegial relations, and of course to fit into their respective institutional research priorities Despite these differences in the framework of research in both countries, there are several areas in which mutual research interest exist and should be encouraged One of these is greenhouse design Relatively little work has been done anywhere in the design of low-cost greenhouses for desert climates This is because the centers for greenhouse research are in Holland and England, where design priorities are very different In both Israel and Egypt, the existing greenhouses are mostly unheated, fairly inexpensive structures Thus, it seems that it would be mutually beneficial to explore the economic trade-offs between the current structures and high-tech greenhouses Ideally, a cost-effective, design could offer farmers some of the advantages of Dutch style heated, computerized greenhouses at affordable prices There was quite a bit of interest and mutual interaction between Israeli and Egyptian scientists on these questions, not only in the presentations but at the summary session and in private conversations afterwards Mutual collaboration seems likely and should be encouraged

Another area of obvious mutual interest is stress, particularly cold stress Egyptian work has concentrated on chemical protectants, while the Israeli work has focused on breeding Presumably any progress in this area will be of wide interest Although not specifically reported on in the Workshop, there was also considerable interest in heat stress research Salinity stress was of interest to the Egyptians, again mainly in the area of using chemical protectants, and to the Israelis who are using saline irrigation water to increase soluble solids and portharvest storage life in fruits The trade-off in reduced yield is accepted by Israeli growers or compensated for by higher densities because of the higher prices received in the off-season export market

The general comment can be made that plants growing in protected agriculture in both countries are likely to experience considerably more cold, heat and salinity stress than plants grown in the temperate-zone protected agriculture Any advances in helping plants avoid or tolerate these stresses should be of mutual interest It is to be hoped that any tolerant germplasm developed will be made available to other CALAR-sponsored researchers The breeding programs for powdery mildew resistance in cucumbers and tomato yellow curl virus in tomatoes are also very promising and it is

to be hoped that germplasm can be exchanged, as was done with the saline-tolerant tomato developed in Egypt, the "Edkawy", which is the basis for the Desert Sweet brand of tomato Israel is developing for export

In summary, the main areas of overlap in research interest of current projects are in the areas of structure design and plant stress Hopefully, there will be continued and expanded cooperation in these areas In addition, as a general comment, there seemed to be a great deal of support for the concept and functioning of the CALAR program among participants at all levels This was based not just on the funding received in each country, or on the scientific exposure resulting from CALAR-funded travel, but also from genuine feeling that each participant was making a personal contribution to the peace process A challenge for the future is how to extend the motivating factors of a desire for professional gain, a desire for knowledge and a desire for peace, beyond the present cadre of CALAR-trained scientists

V GENERAL OBSERVATIONS

CALAR has been a tremendous success to this point and has been beneficial to both Egypt and Israel In particular, the following gains stand out

- For Egyptian scientists, CALAR has made possible an increase in technical sophistication because of funds provided for equipment purchase and training The research quality has also been improved through support for specific research problems There has also been an improvement in the reporting and presentation of these research results Finally, CALAR has been successful in creating a more open and positive attitude towards both individual Israeli scientists and towards the Israeli people

- Similarly, for the Israeli scientists, CALAR has provided an opportunity for individuals to overcome societal prejudices and to develop mutually beneficial relationships with Egyptian scientists In addition, the Israeli scientists, like their Egyptian counterparts, benefited from the free exchange of ideas in an international scientific setting and from the additional research funds available

VI. RECOMMENDATIONS

On both the Egyptian and Israeli side, there is a dedicated group of administrators who are working very hard to ensure the success of the project Their level of professional and personal commitment to CALAR objectives extends far

beyond normal administrative responsibilities At the same time, there are a number of technical suggestions which could perhaps make the Workshop itself more valuable to all participants First among these would be to standardize and upgrade the quality of the abstracts Some were 2 pages long with clear introduction, materials and methods, testing and discussion of results, and a summary of the conclusions Others, however, were only a few sentences long, and mentioned only what was to be discussed, not the actual results Some did not indicate if differences were significant or how they varied between treatments or did not adequately address the significance of the work to either an applied or a basic question Another feature which would make the abstracts more useful is to include a reference to any published work on this subject by the authors For example, many of the papers are described more fully in a recent Acta Horticulturae and this would be a valuable reference for participants wanting more information These same criticisms could no doubt be leveled at many abstracts presented at large professional society meetings However, in the case of large society meetings space is limited and abstracts are submitted up to 6 months in advance These constraints should not apply to the CALAR Workshop

Another suggestion would be to improve the opportunities for mixing of the participants The Steering Committee and other participants may have some suggestions As an example, dinner seating could be assigned by discipline, or randomized Similarly, a formal welcoming reception and/or closing reception could facilitate contacts This is especially important for the younger scientists who have not attended previous meetings

Previous meetings featured these receptions, but Ramadan and rescheduling may have precluded additional social functions Another suggestion forwarded by one of the American cooperators was to divide participants into mini-workshops focused on problem definition in research areas of mutual interest The goal of these workshops could be to develop approaches for future research, to stimulate interaction, and possibly collaborative research Younger scientists might feel more comfortable speaking out in a smaller, less formal group, especially if skillful facilitators were present Such a facilitator could also help in problem definition and goal-setting Possibly "mini-grants" could also be available where clear areas of bi-national interest were identified In many cases, there is a benefit in comparing the pros and cons of approaches in both countries to the same problems A valuable function of the CALAR workshops, both as currently structured and in a mini-workshop format is to provide a "safe" format to question current approaches and hopefully to stimulate new approaches

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